

Historic, archived document

Do not assume content reflects current
scientific knowledge, policies, or practices.



Research Note

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

INTERMOUNTAIN FOREST & RANGE EXPERIMENT STATION
OGDEN UTAH

No. 20

June 1955

INFILTRATION RATES OF TWO WATERSPREADING PROJECTS, DAVIS COUNTY, UTAH

Richard B. Marston
Division of Watershed Management Research

Many of the Wasatch Mountain front watersheds that drain into Great Salt Lake yield surplus streamflow in the winter and spring months and inadequate flows for irrigation and domestic use during the summer and fall. Economical surface reservoir sites are not available in most of the smaller watersheds for storing the surplus runoff. The only other alternative for capturing the surplus runoff is to spread it for storage underground.

Two attempts have been made in the Davis County portion of the Wasatch front area to recharge the ground water supply by spreading surplus spring runoff. The methods used for spreading the water and the amount and rate of water infiltrated are herein reported.

CENTERVILLE PROJECT

On December 23, 1937, measurements were begun of surplus water diverted from Centerville Creek into a basin about 2,610 feet long and 43 feet wide that had been dug along the foothills southward from the creek channel. The surface area of this basin at the crest of the overflow is about 2.61 acres. This basin, at about 4,800 feet elevation, is about one-half mile east of the town of Centerville, and 400 to 500 feet higher in elevation (figure 1).

The flow into the Centerville project was measured by Wasatch Research Center personnel from 1937 to 1949 using a standard measuring section equipped with a continuous recorder. The United States Geological Survey assumed the responsibility of these measurements in 1949. They use a continuous recorder in conjunction with a 12-inch Parshall measuring section.



Figure 1.--Part of Centerville waterspreading basin full of water.

The amount of water diverted into the basin between 1937 and 1953 varied from about 160 acre feet to about 430 acre feet per water-year and totaled 4,830 acre feet (table 1).

The average wetted area of the basin during the 1938-1939 water-year was 0.83 acre, and the 415 acre feet disappeared in 222 days. The total loss was thus about 6,000 inches, or 27 inches per day, per unit of area exposed. This is 5 times as much as has been reported for a waterspreading project at Seabrook Farms, New Jersey, where "...one spot got more than 1,200 inches in a year, making it the rainiest rain forest in the world."^{1/}

^{1/} Thornthwaite, C. W. Annual report for 1952-1953, Division of Geology and Geography, National Research Council, pp. 65-69, July 1953.

Table 1.--Total annual inflow, Centerville waterspreading basin

Waterflow year	Inflow	Waterflow year	Inflow
	<u>Acre feet</u>		<u>Acre feet</u>
1937-38	372	1945-46	<u>1/</u> 227
1938-39	415	1946-47	228
1939-40	355	1947-48	235
1940-41	430	1948-49	160
1941-42	288	1949-50	308
1942-43	329	1950-51	305
1943-44	256	1951-52	289
1944-45	267	1952-53	<u>366</u>
		Total	4,830

1/ Some water ran out through the overflow this year.

More intensive observations of the changes in depth were possible on two occasions, when the water was turned out of the basin for a short time.

On April 24, 1938, the water was turned out at 9:30 a.m. It was turned back in the next afternoon at 3:30 p.m. During these 30 hours the water level decreased 4.6 feet and approximately 1.1 acres of ground were covered with water. This is equivalent to 38.7 inches of infiltration per day per unit of area.

During the 6 hours between 10:00 a.m. and 4:00 p.m., on April 6, 1942, with no inflow, the water level dropped 11 inches. Approximately 3.25 acres of the sides and bottom of the basin were in contact with water. Thus the infiltration rate per unit of area was 1-1/6 inches per hour. At this rate 28 inches would be infiltrated in 24 hours.

The infiltration capacity of the basin tended to decrease from year to year as fine sediments carried by the inflowing water settled out onto the bottom. Scarifying the bottom with power equipment temporarily increased the infiltration rate.

Although these infiltration rates are extremely high, measurements in the area below the basin showed no significant change in the ground water. Evidence that the infiltrated surplus water could be recovered in the valley below has, therefore, been inconclusive.

BOUNTIFUL PROJECT

In 1941, a tractor-built basin somewhat similar to the one at Centerville was constructed about 1 mile east of Bountiful. However, the infiltration rate of the basin of this project was negligible. Mr. A. R. Croft, who was in charge of the Wasatch Research Center at that

time, suggested the water be turned into a patch of young chokecherry and middle-aged oakbrush that was nearby. This was done by diverting water at several places from a ditch (figure 2). Mr. Croft estimated the area of this brush patch to be no larger than 2.5 acres. Though large quantities of water were run into it, the water was all absorbed and none ever ran out the lower end.



Figure 2.--At the Bountiful waterspreading project the water was turned into a patch of chokecherry and oakbrush by means of small flumes buried in the bank of the diversion ditch.

Use of this project has been severely curtailed in recent years, but during the 7 spreading seasons between 1941 and 1947 the amount of water diverted varied from 56 acre feet to 450 acre feet per year and totaled 1,941 acre feet, or 9,317 inches per unit of area (table 2).

Prorated on the basis of a 2.5-acre spreading area, the most rapid infiltration, 22.4 inches per day per unit of area, occurred during 12 days in 1941. The greatest total amount, 2,160 inches per unit of area, occurred in 1946. During the 4 years 1944 to 1947, the annual amount varied between 1,440 and 2,160 inches per unit of area. During each of these years, it was greater than that reported for Seabrook Farms.

Table 2.--Total annual inflow, Bountiful waterspreading project

Year	Number of days during diversion period	Amount water diverted	Prorated on 2.5 acres	
		<u>Acre feet</u>	<u>Inches</u>	<u>Inches per day</u>
1941	12	$\frac{1}{2}/ 56$	269	22.4
1942	66	$\frac{2}{2}/180$	864	13.1
1943	44	$\frac{2}{2}/130$	624	14.2
1944	119	$\frac{2}{2}/300$	1,440	12.1
1945	112	$\frac{2}{2}/400$	1,920	17.1
1946	111	$\frac{2}{2}/450$	2,160	19.46
1947	105	$\frac{2}{2}/425$	2,040	19.4
		1,941	9,317	

1/ Measurement by Bountiful City.

2/ Measurement by U. S. Geological Survey. See Thomas, H. E.
Artificial recharge of ground water by the City of Bountiful,
Utah. Amer. Geophysical Union Trans. 30(4): 539-542. 1949.

Under this project the infiltrated water returned to the surface within a few hundred yards of where it was spread. This return of the water to the surface was due to an impervious clay lens under the brush patch which prevented deep percolation of the absorbed water and provided for its release where the clay lens outcropped, downslope. Part of the spread water could be recovered and used, but so much of it appeared to be threatening existing property values that the project had to be curtailed and closely supervised.

CONCLUSIONS

The high and sustained rates of infiltration observed in both the constructed basin at Centerville and the brush area at Bountiful suggests either of these types of waterspreading may be useful in storing water underground during periods of surplus streamflow. However, any such attempt should be undertaken only after investigations of the underlying strata indicate the spread water will sink to ground water basins where it can be recovered.

